**Algebra IB Name:**

**Mr. Stiff Period:**

**Final Exam Study Guide Date:**

**Part 1: Written Explanation**

1. What is a function?

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1. Based on your definition, would the relationship between the height of a sunflower and the number of hours of sunlight it gets be a function? Give as clear and specific of an explanation as possible.

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1. A friend wants to do know how he can tell that a group of inputs and outputs in an input-output table is really a function. Give him a **step by step** explanation. Number your steps, and be as clear and specific as possible.
2. What is meant by the *rule* of a function?

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1. Give an example of a function and explain its *rule* in words.

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* 1. Explain the main differences between a *linear* function, an *exponential* function, and a *quadratic* function.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Linear Function** | **Exponential Function** | **Quadratic Function** |
| Draw **and** name the function shape |  |  |  |
| What causes the function to have this shape? |  |  |  |

* 1. **Draw** and **explain** the difference between the **solution** to a linear equation and a **solution** to a system of linear equations. Please use correct algebraic terms when appropriate.

|  |  |
| --- | --- |
| Solution to a **linear equation**  Drawing:  Explanation:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Solution to a **SYSTEM of linear equations**  Drawing:  Explanation:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Part 2: Linear vs. Exponential Models**

**Directions for questions 3 – 4:** Determine whether the relationships depicted are linear or exponential. Write the equation that models each relationship, and define your variables where indicated.

* 1. A new gym has 15 members. Every week, it’s adding 5 new members.

**Type of function: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Variables:** \_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. A group of mold cells on an old piece of bread started as 5 cells, but the number of cells is tripling every hour.

**Type of function: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Variables:** \_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 3: Linear Functions**

* 1. Provide **at least two** definitions of what each variable in the slope-intercept version of a linear function represent.
  2. Determine the slope of a line that passes through the points (2, -5) and (-4, 7).

**Slope: \_\_\_\_\_\_\_\_\_**

* 1. Write the equation of a line that has a slope of 5 and a y-intercept of -2. (2 pts)

**Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* 1. Write the equation of the line that passes through the points (1, 6) and (3, 10). (3 pts)

**Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* 1. Write the equation for the line that is parallel to and passes through the point (2, 5). (3 pts)

**Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* 1. Write the equation for the line that is perpendicular to and passes through the point (4, -1). (3 pts)

**Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* 1. Graph the following linear functions. (3 pts each)

|  |  |
| --- | --- |
|  |  |

* 1. Graph the following linear functions:

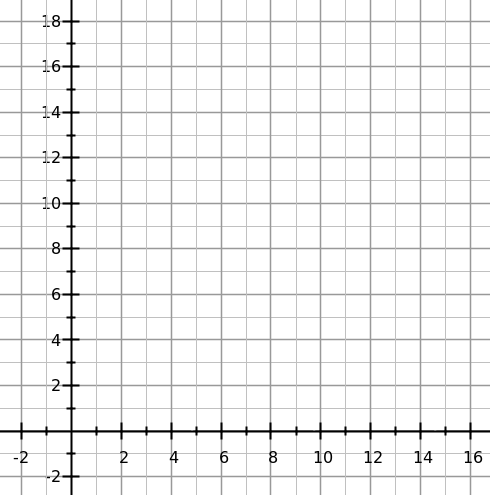
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | |  |  | | --- | --- | | **x-intercept: (\_\_\_, \_\_\_\_)** | **y-intercept: (\_\_\_, \_\_\_\_)** | |  |  | |

* 1. Write the slope-intercept form equation for the following lines. (3 pts each)

|  |  |
| --- | --- |
| **Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Directions for questions 14 – 17:** Read the scenario, then complete the input-output table, graph the relationship (**label your axes)** and answer the two questions that follow.

**Scenario:** *A tree planted in front of the new gym is 6 feet tall. It grows by 3 feet each year.*



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***x*** | **0** | **1** | **2** | **3** |
| ***y*** |  |  |  |  |

* 1. What do the two variables represent?

*x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*y =* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Write the equation that represents this relationship.

**Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* 1. If the tree kept growing at the same rate, how tall would it be in 55 years?
  2. How many years have gone by if the tree in front of the gym is 75 feet tall?

**Part 5: Solutions and Systems**

* 1. Is (2, 15) a solution to the equation ? Explain your choice.

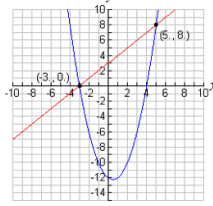
**Answer:** (2, 15) **is / is not**  (circle one) a solution to the equation because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Which of the following is a solution to the system below?

1. (2, 1)
2. (-1, -4)
3. (1, 3)
4. (3, 7)
   1. How many solutions does this system have?



1. Zero solutions.
2. One solution.
3. Two solutions.
4. Infinite solutions.
   1. Solve the following system using **substitution.**

**Solution: ( \_\_\_\_\_\_\_ , \_\_\_\_\_\_\_ )**

* 1. Solve the following system using **elimination.**

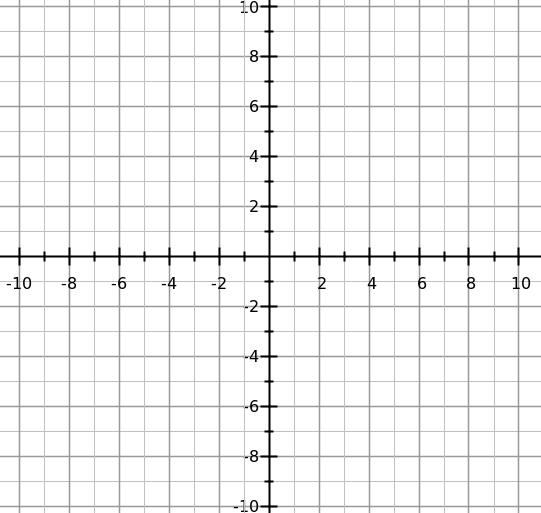
**Solution: ( \_\_\_\_\_\_\_ , \_\_\_\_\_\_\_ )**

* 1. What are the three options for how many solutions a system of linear equations can have? Explain each of the options in the table below.

|  |  |  |
| --- | --- | --- |
| Graph:  Explanation: | Graph:  Explanation: | Graph:  Explanation: |

**Part 6: Linear Inequalities and Systems of Linear Inequalities**

* 1. Graph the following linear inequality. Be sure to clearly indicate whether your line is dashed or solid, and clearly shade in the solution zone.



**Inequality:**

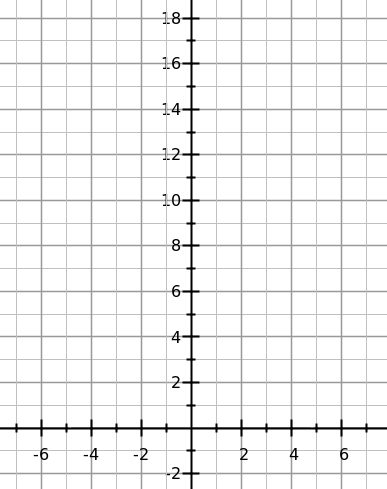
* 1. Graph to show the solutions to the following system of linear inequalities. Be sure to clearly indicate whether your line is dashed or solid, and clearly shade in the solution zone.



**System:**

**Part 7: Simplifying Exponential and Radical Expressions**

1. Simplify and **box your final answer**:
2. Simplify and **box your final answer**:
3. Simplify and **box your final answer**:
4. Simplify and **box your final answer:**

**Part 8: Exponential Functions**

1. Complete the input-output table and graph.

|  |  |
| --- | --- |
|  |  |
| **-3** |  |
| **-2** |  |
| **-1** |  |
| **0** |  |
| **1** |  |
| **2** |  |
| **3** |  |

**Equation:**

1. At the start of 2010 there were 300 deer in Rock Creek Park. Since then, the number of deer has grown by 2% each month. How many deer were there at the start of 2015?
2. You bought your first car 5 years ago for $26,550. Since then, the value of the car has depreciated by 4% each year. How much is the car worth now?

**Part 9: Polynomials**

1. Write the following polynomials in standard form and then name them.

|  |  |  |
| --- | --- | --- |
| **Original** | **Standard Form** | **Name** |
|  |  |  |
|  |  |  |
|  |  |  |

1. Add the following polynomials and write in standard form.

**Standard Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Multiply and write in standard form.

**Standard Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Multiply and write in standard form.

**Standard Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Multiply and write in standard form.

**Standard Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Factor completely (GCF).

**Factored Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

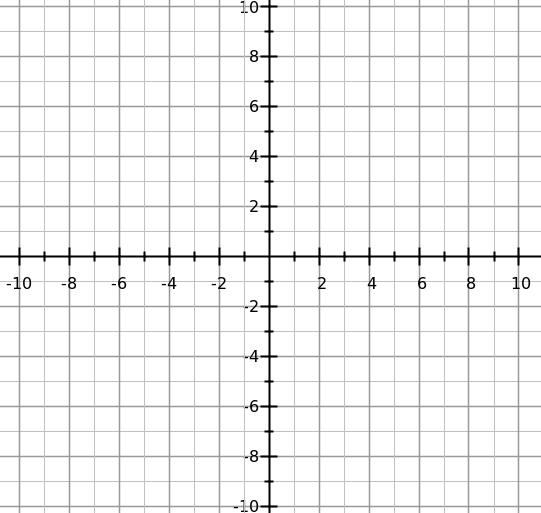
1. Factor completely.

**Factored Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Factor completely.

**Factored Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Part 10: Quadratics**

1. Identify the features of the **standard form** quadratic function.
   1. Opens up or down? \_\_\_\_\_\_\_\_\_\_\_
   2. Wider than, narrower than or same width as the parent quadratic? \_\_\_\_\_\_\_\_\_\_\_\_
   3. Axis of Symmetry, *x* = \_\_\_\_\_\_\_\_\_
   4. Vertex: ( \_\_\_\_\_ , \_\_\_\_\_\_ )
2. Identify the features of the **vertex form** quadratic function.
   1. Opens up or down? \_\_\_\_\_\_\_\_\_\_\_
   2. Wider than, narrower than or same width as the parent quadratic? \_\_\_\_\_\_\_\_\_\_\_\_
   3. Axis of Symmetry, *x* = \_\_\_\_\_\_\_\_\_
   4. Vertex: ( \_\_\_\_\_ , \_\_\_\_\_\_ )
3. Graph: .

Axis of Symmetry: \_\_\_\_\_\_\_

Vertex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

*a =* \_\_\_\_\_\_\_\_\_\_\_\_\_

1. Graph:

Axis of Symmetry: \_\_\_\_\_\_\_

Vertex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

*a =* \_\_\_\_\_\_\_\_\_\_\_\_\_

1. Use the quadratic formula to solve.
2. Solve by factoring.